IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.	:	09/885,319	Confirmation No.: 4594
Applicant	:	Mark A. Stan, *et al.*	
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DECLARATION UNDER 37 C.F.R. § 1.131

I, the undersigned, declare that:

1. My name and residence is as listed below.

2. I am a joint inventor in the above-identified patent application ("The Patent Application").

3. Hong Q. Hou, one of the listed inventors of The Patent Application, participated in the development of processes for the fabrication of solar cells, and prepared records describing such processes, prior to March 29, 1999.

4. The document attached hereto as Exhibit 1 is a summary of an actual process control instruction sheet as stored in computer archival storage maintained by the assignee of the Patent Application, Emcore Corporation of Somerset, New Jersey ("Emcore"), at its Albuquerque, New Mexico facility. The print-out was printed from the archival storage file on

March 1, 2007, as indicated by the date "3/1/2007" on the top right hand portion of each of the pages.

5. Associated file records of Emcore, attached hereto as Exhibit 2 with the actual dates being redacted, show that the date of the original document represented in Exhibit 1, and correspondingly the actual process run itself, was made prior to March 29, 1999.

6. Exhibit 1 is a summary of the growth "recipe" of a test run of a triple-junction solar cell. The "recipe" is a sequence of instructions for controlling an Emcore E400 Reactor (hereinafter, the "Reactor") installed at Emcore's facilities in Somerset, New Jersey, used for metal organic chemical vapor deposition (MOVCD) growth of identified chemical elements or compounds on the surface of a substrate contained in the reactor chamber.

7. Each line in the summary file represents a distinct process step performed as part of the fabrication process.

8. The detailed recipe control from which this summary was generated was loaded into a control computer of an Emcore E400 model MOVCD reactor to control the "on" or "off" switches and amount of gas flow of each chemical from a bubbler through gas lines in the Reactor.

9. The identified process identified in Exhibit 1 is one of a number of actual process runs conducted on a germanium substrate for research and development purposes relating to the deposition of surface layers for the creation of different solar cell semiconductor structures that were conducted on the Reactor in Somerset, NJ during 1999.

10. Hong Q. Hou participated in both the conception and specification of the materials systems and layers of the desired solar cell, and the actual implementation and performance of the process of Exhibit 1 on the Reactor. The process of Exhibit 1 resulted in the fabrication of a wafer including a solar cell having a layer of material selected from the group lnP and InGaP disposed directly on a germanium substrate and resulting in the formation of a diffused photoactive germanium junction in the substrate. The process of Exhibit 1 further resulted in the formation of a GaAs solar subcell over the InGaP layer, and the formation of a top solar cell composed of $InGaP_2$.

11. Referring to page 2 of Exhibit 1, the entry beginning with "TMAl" represents the process instructions for a first reactant, which in the E6523 process actually corresponds to the flow of trimethylindium. The use of the term "Al" in the "TMAl" was included in the software control instruction because the software identifying the register of the control line was designed and used in the past for a similar process involving aluminum, rather than indium. Since the use of indium as a constituent element was a new idea, the actual chemical compound in the bubbler connected to the "Al" line was changed to trimethylindium. However, the computer software had not yet been rewritten to designate "indium" or "In" instead of "aluminum" or "Al," along with its deposition conditions when the actual E6523 process was performed.

12. The process associated with the flow of trimethylindium at various timed intervals is represented by the sequence of columns to the right of the process instruction entries labeled Layer #1, Layer #2, etc., with various specified time durations. The term "Layer" does not necessarily refer to an actual physical layer being grown on the substrate, but may be

considered discrete process "steps', such as preparing the reactor chamber for subsequent steps.

13. The process instructions on page 1, line 4 (wherein the "page" number in this Declaration refers to the printout page number indicated at the bottom of each attached sheet) beginning with "TMGa# 1-4," and continuing on to the first two entries on page 2, correspond to the flow of trimethylgallium, the metal organics for gallium, into the reactor chamber.

14. On page 2, line 3 of Exhibit 1, the process instructions labeled "ASH3#2_42" on page 2, line 3, corresponds to the flow of arsine into the Reactor.

15. On page 2, line 4, the entry line labeled "PH3_43" identifies a process instruction to the Reactor associated with the flow of phosphine at various timed intervals represented by the columns (labeled on page 1) as Layer #1 (4.000 min), Layer #2 (6.000 min), etc. The letters "V" and "R" indicate that the flow is switched from a "vent" position to a "run" position, with the phosphine being introduced into the reactor chamber at the time intervals corresponding to the "R" notations.

16. The nucleation layer is designed to be n-type doped in InGaP on Ge. During the growth of the nucleation layer of InGaP, only TMIn and TMG were supplied for group-III growth; phosphine for group-V growth, and a doping quantity of silane was provided as dopant.

17. The growth of the InGaP layer on the germanium substrate is evidenced by the sequence of entries in the column labeled "Layer # 7 0.650 min" on page 2 of the Exhibit.

18. More particularly, the entry "TMAl_7" 852.00 ccm R evidences the entry of trimethylindium, and "TMGa # 1-4" at 41.00 ccm R evidences the entry of trimethylgallium into the Reactor during the growth process on the germanium substrate.

19. The ratio of gas flows between TMIn and TMGa were adjusted to make the lattice constant of InGaP match that of the germanium substrate.

20. The entry on page 3, line 3, "PH3_43" with "2000 ccm R" at Layer # 7 evidences the entry of phosphine during the growth process.

21. The entries set forth in the Exhibit in the "Layer # 7" column resulted in the formation of an InGaP layer on the germanium substrate. Thus, the executed steps of Layer # 7 produces a phosphorus-containing layer deposited on the surface of the germanium substrate.

22. The entries in the column for "Layer # 10" on page 2 and 3 of the Exhibit evidence the formation of a layer of GaAs over the preceding layer of InGaP.

23. More particularly, on page 2 the entry "TMGa# 1-4 at 100.00ccm R" corresponds to the entry of trimethylgallium into the Reactor, and on page 3 the entry "AsH3# -42 at 1200.0 ccm R" evidences the entry of arsine.

24. As a result of the execution of the steps set forth for Layer # 10 in the Exhibit, a layer of GaAs is grown over the layer of InGaP.

25. The deposition of a GaAs layer over the layer of InGaP on a germanium substrate resulted in the diffusion of arsenic into the germanium substrate, as claimed in the Patent Application.

26. The entries set forth in the Exhibit in the "Layer # 10" column resulted in the formation of a middle solar subcell formed from GaAs overlying the germanium solar subcell, as claimed in the Patent Application.

27. The InGaP layer would function as a barrier layer inhibiting the diffusion of other elements into the substrate. In particular, the barrier layer would function to inhibit (but not entirely prevent) the diffusion of arsenic from the GaAs layer into the germanium substrate, as claimed in the Patent Application.

28. As a result of the execution of the steps set forth for Layer #7 in the Exhibit, the layer of InGaP material has a lattice parameter substantially equal to the lattice parameter of the germanium substrate, as claimed in the Patent Application.

29. As a result of the execution of the steps set forth for Layer #7 in the Exhibit, the layer of InGaP has a thickness equal to 350 Angstroms or less, as claimed in the Patent Application.

30. As a result of the execution of all the steps of the process identified in the Exhibit, a solar cell is fabricated which is capable of photoactively converting radiation ranging from approximately ultraviolet (UV) radiation to radiation having a wavelength of approximately 1800 nm, as claimed in the Patent Application.

31. As a result of the execution of the steps set forth for Layers 1 through 10 in the Exhibit, the junction in the germanium substrate layer is located between 0.3 µm and 0.7 µm from the top surface of the germanium substrate, as claimed in the Patent Application.

32. As a result of the execution of the steps set forth for Layers 1 through 10 in the Exhibit, the diffused germanium substrate forms a first cell layer and has a dopant diffusion profile that optimizes the current and voltage generated therefrom, as claimed in the Patent Application.

33. As a result of the execution of all the steps of the process identified in the Exhibit, a solar cell is fabricated which has 1 sun AM0 efficiencies in excess of 26%, as claimed in the Patent Application.

34. As a result of the execution of the steps set forth for Layers 1 through 7 in the Exhibit, a solar cell is fabricated that has: a germanium substrate; a solar subcell layer overlying said substrate and composed of GaAs; and a barrier layer overlying said substrate and underneath said solar subcell layer and functioning to inhibit the diffusion of arsenic into the germanium substrate, as claimed in the Patent Application.

35. As a result of the execution of the steps set forth for Layers 1 through 10 in the Exhibit, a solar subcell is formed in the germanium substrate, as claimed in the Patent Application.

36. As a result of the execution of the steps set forth for Layers 1 through 10 in the Exhibit, the subcell formed in the germanium substrate is formed from a n-type germanium layer overlying a p-type germanium substrate, as claimed in the Patent Application.

37. As a result of the execution of the steps set forth for Layers 1 through 10 in the Exhibit, the n-type germanium layer is formed by a diffusion of arsenic and/or phosphorus into the germanium substrate, as claimed in the Patent Application.

38. As a result of the execution of the steps set forth for Layers 1 through 7 in the Exhibit, the barrier layer is composed of InGaP, as claimed in the Patent Application.

39. As a result of the execution of the steps set forth for Layers 1 through 7 in the Exhibit, the barrier layer has a thickness of between 201 and 350 Angstroms, as claimed in the Patent Application.

40. As a result of the execution of the steps set forth for Layers 1 through 10 in the Exhibit, a two step diffusion profile is formed in the germanium substrate with two different dopants, as claimed in the Patent Application.

41. As a result of the execution of the steps set forth for Layers 1 through 10 in the Exhibit, a solar cell is fabricated having: a first cell including a germanium (Ge) substrate having a diffusion region doped with n-type dopants including phosphorus and arsenic, wherein the upper portion of such diffusion region has a higher concentration of phosphorus (P) atoms than arsenic (As) atoms; and a second cell including a layer of either gallium

arsenide (GaAs) or indium gallium arsenide (InGaAs) disposed over the substrate, as claimed in the Patent Application.

42. As a result of the execution of the steps set forth for Layer #7 in the Exhibit, a nucleation layer is deposited over said substrate that has a lattice parameter substantially equal to the lattice parameter of the germanium substrate, as claimed in the Patent Application.

43. As a result of the execution of the steps set forth for Layer #7 in the Exhibit, the nucleation layer is a compound of InGaP, as claimed in the Patent Application.

44. As a result of the execution of the steps set forth for Layer #7 in the Exhibit, the nucleation layer has a thickness equal to 350 Angstroms or less, as claimed in the Patent Application.

45. As a result of the execution of the steps set forth for Layers 1 through 10 in the Exhibit, the diffused phosphorus and arsenic in the germanium substrate has a diffusion profile that optimizes the current and voltage generated in the first cell, as claimed in the Patent Application.

46. As a result of the execution of the steps set forth for Layers 32 through 40 in the Exhibit, a third solar subcell is fabricated which is disposed over the second cell.

47. As a result of the execution of all the steps set forth in the Exhibit, a triple-junction solar cell is fabricated that has: a dual-junction structure comprising a first junction and a second junction; a third junction having a p-type substrate (i.e. germanium), wherein the third

junction is doped with arsenic (As) and phosphorus (P), wherein the p-type substrate includes first and second diffusion sublayers, wherein P atoms have a higher concentration compared to P atoms in the second diffusion sublayer; and a nucleation layer (as fabricated as a result of the steps of layer 7 of the Exhibit) is disposed between the dual-junction structure and the third junction and comprising a material that shares a substantially similar lattice parameter with the p-type substrate of the third junction, wherein the nucleation layer serves to control the diffusion of arsenic atoms into the substrate, as claimed in the Patent Application.

48. As a result of the execution of the steps set forth for Layers 1 through 7 in the Exhibit, the p-type substrate of the third junction is germanium (Ge) and the nucleation layer comprises indium gallium phosphide (InGaP), as claimed in the Patent Application.

49. As a result of the execution of the steps set forth for Layers 1 through 10 in the Exhibit, the third junction (i.e. in the germanium substrate) comprises a two-step diffusion profile capable of optimizing current and voltage generated from the third junction, as claimed in the Patent Application.

50. As a result of the execution of the steps set forth for Layers 1 through 11 in the Exhibit, A multi-junction solar cell is fabricated that has: a p-type germanium (Ge) substrate having a first surface, wherein the p-type Ge substrate further includes a diffusion portion having a first diffusion region situated adjacent to the first surface of the p-type Ge substrate and a second diffusion region, which includes a part of the first diffusion region, wherein the second diffusion region diffuses deeper into the Ge substrate than the first diffusion region; a phosphorus (P) containing nucleation layer disposed over the first surface of the p-type Ge substrate, wherein the P containing nucleation layer provides n-type P atoms to the first

diffusion region; and an arsenic (As) buffer layer disposed over the P containing nucleation layer, wherein the As containing buffer layer provides n-type As atoms to the second diffusion region in response to the thickness of the P containing nucleation layer, wherein the second diffusion region has a higher concentration of As atoms than P atoms

51. As a result of providing a germanium substrate, and as a result of the execution of all the steps set forth in the Exhibit, a second surface is situated at the bottom of the multi-junction solar cell, as claimed in the Patent Application.

52. As a result of the execution of the steps set forth for Layers 1 through 10 in the Exhibit, the first diffusion region has a higher concentration of P atoms than As atoms, as claimed in the Patent Application.

53. As a result of the execution of the steps set forth for Layers 1 through 10 in the Exhibit, a multi-junction solar cell is fabricated that has: a germanium (Ge) substrate having a first diffusion region and a second diffusion region, wherein the second diffusion region diffuses deeper into the Ge substrate than the first diffusion region; a phosphide nucleation layer disposed over the first surface of the substrate, wherein the phosphide nucleation layer provides diffusion dopants of phosphorus (P) atoms to the first diffusion region; and an arsenide layer disposed over the phosphide nucleation layer, wherein the arsenide layer provides diffusion dopants of arsenic (As) atoms into the second diffusion region in response to the thickness of the phosphide nucleation layer, wherein the first diffusion region has a higher concentration of P atoms than As atoms, as claimed in the Patent Application.

54. As a result of providing a germanium substrate, and as a result of the execution of all the steps set forth in the Exhibit, a second surface is situated at the bottom of the multi-junction solar cell, as claimed in the Patent Application.

55. As a result of the execution of the steps set forth for Layers 1 through 11 in the Exhibit, the second diffusion region has a higher concentration of As atoms than P atoms, as claimed in the Patent Application.

56. The entries set forth in the "Layer # 32-38" in the Exhibit resulted in the formation of an $InGaP_2$ layer over the GaAs subcell, as claimed in the Patent Application.

57. Mark A. Stan, Nein Y. Li, Frank A. Spadafora, Paul R. Sharps, and Navid S. Fatemi each participated in the development of the subject matter claimed in this patent application after March 29, 1999.

58. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statement were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001.

Name: Mark A. Stan

City: Albuquerque, NM

Signature: ______________________ Date: 4/12/07

Name: Nein Y. Li

City: Albuquerque, NM

Signature: ______________________ Date: 4/12/07

Name: Frank A. Spadafora

City: ______________________

Signature: ______________________ Date: __________

Name: Hong Q. Hou

City: Arcadia, CA

Signature: ______________________ Date: 04/12/07

Name: Paul R. Sharps

City: Albuquerque, NM

Signature: Paul R. Sharps Date: 4/12/07

Name: Navid S. Fatemi

City: Albuquerque, NM

Signature: ______________________ Date: 4/12/07

Name: Mark A. Stan

City: ____

Signature: ______________________________ Date: __________

Name: Nein Y. Li

City: ____

Signature: ______________________________ Date: __________

Name: Frank A. Spadafora

City: BADEN, PA

Signature: [signature] Date: 7/17/2007

Name: Hong Q. Hou

City: ____

Signature: ______________________________ Date: __________

Name: Paul R. Sharps

City: ____

Signature: ______________________________ Date: __________

Name: Navid S. Fatemi

City: ____

Signature: ______________________________ Date: __________

EXHIBIT 1

Emcore Process Printout

This process is stored in the file :
Directory :
Filename : XE6523~1.ERF

Total Run Time : 94.501 min

This printout contains the following fields :
    Process Control Line Set Point
    Process Control Line Command

Process comments :

NUC66 recipe: P drive-in instead of As drive-in
2P, 3P mixed platter with new pockets
BASELINE: e6517 WITH MODIFICATIONS AND SPECIFICS
Modifications: Baseline for TJN runs
    Layer30, Time 1.9>0.95 min (InGaAlP BSF), InGaP base 10>6.5 min
Purpose: P drive-in with InGaP nucleation

Test: Surfscan, Polaron, PL, and V-probe

Emcore Process Printout

	Layer # 1 4.000min	Layer # 2 6.000min	Layer # 3 6.000min	Layer # 4 2.000min	Layer # 5 2.000min
TMAl_7	400.00ccm I	400.00ccm I	400.00ccm V	650.00ccm V	852.00ccm V
TMAl#1 Pres_23	250.0Tor R	250.0Tor R	250.0Tor R	250.0Tor R	250.0Tor R
TMAl#1_7 MoleFr	0.5700per I	0.5700per I	0.5700per I	0.5700per I	0.5700per I
TMGa#1_4	41.00ccm I	41.00ccm I	41.00ccm I	41.00ccm I	41.00ccm V
TMGa#1 Pres_20	950.0Tor R	950.0Tor R	950.0Tor R	950.0Tor R	950.0Tor R
TMGa#2_5	140.00ccm I	140.00ccm I	140.00ccm I	140.00ccm I	140.00ccm I
TMGa#2 Pres_21	350.0Tor R	350.0Tor R	350.0Tor R	350.0Tor R	350.0Tor R
TEGa_6	36.10ccm I	36.10ccm I	36.10ccm I	36.10ccm I	36.10ccm I
TEGa Pres_22	475.0Tor R	475.0Tor R	475.0Tor R	475.0Tor R	475.0Tor R
AsH3#2_42	0.0ccm V	0.0ccm V	0.0ccm V	0.0ccm V	0.0ccm V
PH3_43	0ccm V	400ccm R	400ccm R	400ccm R	1800ccm R
CCl4_1	200.00ccm I	200.00ccm I	200.00ccm I	200.00ccm I	200.00ccm I
CCl4 Dil_57	200.0ccm R	200.0ccm R	200.0ccm R	200.0ccm R	200.0ccm R
CCl4 mix_58	133.00ccm R	133.00ccm R	133.00ccm R	133.00ccm R	133.00ccm R
CCl4 Pres_17	300.0Tor R	300.0Tor R	300.0Tor R	300.0Tor R	300.0Tor R

Emcore Process Printout

	Layer # 6 0.200min	Layer # 7 0.650min	Layer # 8 3.000min	Layer # 9 0.200min	Layer # 10 12.000min
TMAl_7	852.00ccm V	852.00ccm R	400.00ccm I	400.00ccm I	400.00ccm I
TMAl#1 Pres_23	250.0Tor R	250.0Tor R	250.0Tor R	250.0Tor R	250.0Tor R
TMAl#1_7 MoleFr	0.5700per R	0.5700per R	0.6000per I	0.6000per I	0.6000per I
TMGa#1_4	41.00ccm V	41.00ccm R	100.00ccm V	100.00ccm V	100.00ccm R
TMGa#1 Pres_20	950.0Tor R	950.0Tor R	950.0Tor R	950.0Tor R	950.0Tor R
TMGa#2_5	140.00ccm I	140.00ccm I	140.00ccm V	140.00ccm V	140.00ccm R
TMGa#2 Pres_21	350.0Tor R	350.0Tor R	350.0Tor R	350.0Tor R	350.0Tor R
TEGa_6	36.10ccm I	36.10ccm I	36.10ccm I	36.10ccm I	36.10ccm I
TEGa Pres_22	475.0Tor R	475.0Tor R	475.0Tor R	475.0Tor R	475.0Tor R
AsH3#2_42	0.0ccm V	0.0ccm V	0.0ccm V	1200.0ccm V	1200.0ccm R
PH3_43	2000ccm R	2000ccm R	400ccm R	400ccm R	0ccm V
CCl4_1	200.00ccm I	200.00ccm I	200.00ccm I	200.00ccm I	200.00ccm I
CCl4 Dil_57	200.0ccm R	200.0ccm R	200.0ccm R	200.0ccm R	200.0ccm R
CCl4 mix_58	133.00ccm R	133.00ccm R	133.00ccm R	133.00ccm R	133.00ccm R
CCl4 Pres_17	300.0Tor R	300.0Tor R	300.0Tor R	300.0Tor R	300.0Tor R

Emcore Process Printout

	Layer # 11 2.400min	Layer # 12 0.100min	Layer # 13 1.330min	Layer # 14 0.500min	Layer # 15 1.000min
TMAl_7	400.00ccm I	400.00ccm I	400.00ccm I	400.00ccm I	400.00ccm I
TMAl#1 Pres_23	250.0Tor R	250.0Tor R	250.0Tor R	250.0Tor R	250.0Tor R
TMAl#1_7 MoleFr	0.6000per I	0.6000per I	0.6000per I	0.6000per I	0.6000per I
TMGa#1_4	100.00ccm R	54.17ccm V	54.17ccm R	54.17ccm V	54.17ccm R
TMGa#1 Pres_20	950.0Tor R	950.0Tor R	950.0Tor R	950.0Tor R	950.0Tor R
TMGa#2_5	140.00ccm R	140.00ccm I	140.00ccm I	140.00ccm I	140.00ccm V
TMGa#2 Pres_21	350.0Tor R	350.0Tor R	350.0Tor R	350.0Tor R	350.0Tor R
TEGa_6	36.10ccm I	36.10ccm V	36.10ccm V	36.10ccm V	36.10ccm R
TEGa Pres_22	475.0Tor R	475.0Tor R	475.0Tor R	475.0Tor R	475.0Tor R
AsH3#2_42	1200.0ccm R	400.0ccm R	400.0ccm R	400.0ccm R	400.0ccm R
PH3_43	0ccm V	0ccm V	0ccm V	0ccm V	0ccm V
CCl4_1	200.00ccm V	200.00ccm V	200.00ccm V	200.00ccm V	200.00ccm R
CCl4 Dil_57	200.0ccm R	200.0ccm R	200.0ccm R	200.0ccm R	200.0ccm R
CCl4 mix_58	133.00ccm R	133.00ccm R	133.00ccm R	133.00ccm R	133.00ccm R
CCl4 Pres_17	300.0Tor R	300.0Tor R	300.0Tor R	300.0Tor R	300.0Tor R

Emcore Process Printout

	Layer # 16 1.000min	Layer # 17 0.100min	Layer # 18 9.000min	Layer # 19 3.000min	Layer # 20 2.000min
TMAl_7	400.00ccm I	400.00ccm I	400.00ccm I	400.00ccm V	650.00ccm V
TMAl#1 Pres_23	250.0Tor R	250.0Tor R	250.0Tor R	250.0Tor R	250.0Tor R
TMAl#1_7 MoleFr	0.6000per I	0.6000per I	0.6000per I	0.6000per I	0.6000per I
TMGa#1_4	54.17ccm R	100.00ccm V	100.00ccm R	100.00ccm R	100.00ccm R
TMGa#1 Pres_20	950.0Tor R	950.0Tor R	950.0Tor R	950.0Tor R	950.0Tor R
TMGa#2_5	140.00ccm V	140.00ccm V	140.00ccm R	140.00ccm R	140.00ccm R
TMGa#2 Pres_21	350.0Tor R	350.0Tor R	350.0Tor R	350.0Tor R	350.0Tor R
TEGa_6	36.10ccm R	36.10ccm I	36.10ccm I	36.10ccm I	103.00ccm I
TEGa Pres_22	475.0Tor R	475.0Tor R	475.0Tor R	475.0Tor R	475.0Tor R
AsH3#2_42	1000.0ccm R	1200.0ccm R	1200.0ccm R	1200.0ccm R	1200.0ccm R
PH3_43	0ccm V	0ccm V	0ccm V	0ccm V	0ccm V
CCl4_1	50.00ccm R	200.00ccm I	200.00ccm I	200.00ccm I	200.00ccm I
CCl4 Dil_57	200.0ccm R	200.0ccm R	200.0ccm R	200.0ccm R	200.0ccm R
CCl4 mix_58	133.00ccm R	133.00ccm R	133.00ccm R	133.00ccm R	133.00ccm R
CCl4 Pres_17	300.0Tor R	300.0Tor R	300.0Tor R	300.0Tor R	300.0Tor R

Pages 6 and 7 of Exhibit I (Process Printout) intentionally omitted.

Emcore Process Printout

	Layer # 31 1.000min	Layer # 32 0.950min	Layer # 33 0.500min	Layer # 34 3.813min	Layer # 35 6.500min
TMAl_7	852.00ccm V	852.00ccm R	852.00ccm V	852.00ccm R	852.00ccm R
TMAl#1 Pres_23	250.0Tor R	250.0Tor R	250.0Tor R	250.0Tor R	250.0Tor R
TMAl#1_7 MoleFr	0.6000per R	0.6000per R	0.5700per R	0.5700per R	0.5700per R
TMGa#1_4	31.20ccm V	31.20ccm R	37.00ccm V	37.00ccm R	37.00ccm R
TMGa#1 Pres_20	950.0Tor R	950.0Tor R	950.0Tor R	950.0Tor R	950.0Tor R
TMGa#2_5	140.00ccm I	140.00ccm I	140.00ccm I	140.00ccm I	140.00ccm I
TMGa#2 Pres_21	350.0Tor R	350.0Tor R	350.0Tor R	350.0Tor R	350.0Tor R
TEGa_6	25.20ccm V	25.20ccm R	25.20ccm I	25.20ccm I	25.20ccm I
TEGa Pres_22	475.0Tor R	475.0Tor R	475.0Tor R	475.0Tor R	475.0Tor R
AsH3#2_42	100.0ccm R	0.0ccm V	0.0ccm V	0.0ccm V	0.0ccm V
PH3_43	2000ccm V	2000ccm R	2000ccm R	2000ccm R	2000ccm R
CCl4_1	12.00ccm I	12.00ccm I	12.00ccm I	12.00ccm I	12.00ccm I
CCl4 Dil_57	50.0ccm R	50.0ccm R	50.0ccm R	50.0ccm R	50.0ccm R
CCl4 mix_58	12.00ccm R	12.00ccm R	12.00ccm R	12.00ccm R	12.00ccm R
CCl4 Pres_17	300.0Tor R	300.0Tor R	300.0Tor R	300.0Tor R	300.0Tor R

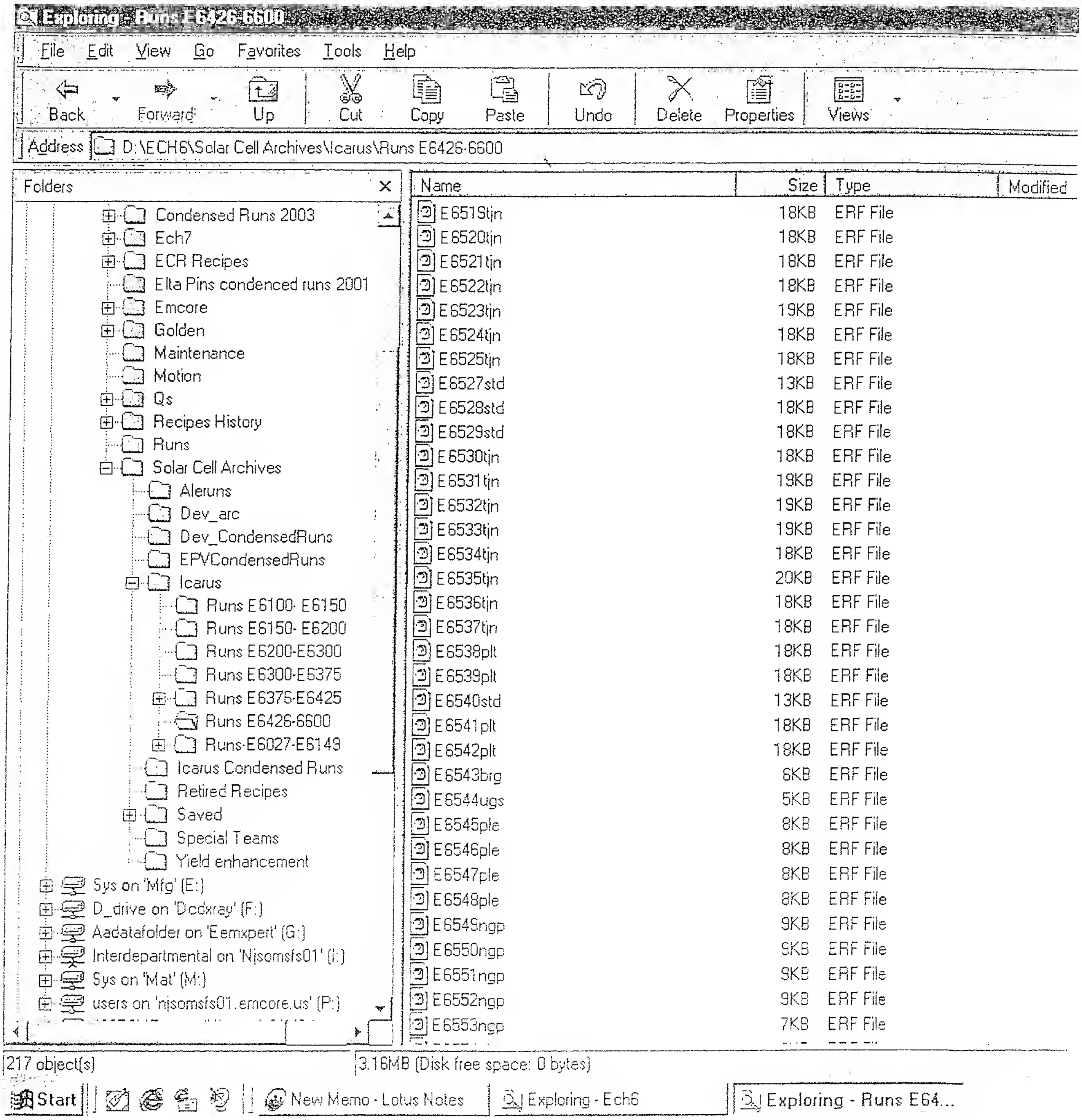
Emcore Process Printout

	Layer # 36 1.000min	Layer # 37 2.400min	Layer # 38 0.440min	Layer # 39 0.150min	Layer # 40 0.860min
TMAl_7	852.00ccm R	852.00ccm R	852.00ccm R	852.00ccm V	852.00ccm R
TMAl#1 Pres_23	250.0Tor R	250.0Tor R	250.0Tor R	250.0Tor R	250.0Tor R
TMAl#1_7 MoleFr	0.5700per R	0.5700per R	0.5700per R	0.6000per R	0.6000per R
TMGa#1_4	37.00ccm R	37.00ccm R	37.00ccm R	37.00ccm I	6.00ccm I
TMGa#1 Pres_20	950.0Tor R	950.0Tor R	950.0Tor R	950.0Tor R	950.0Tor R
TMGa#2_5	140.00ccm I	140.00ccm I	140.00ccm I	140.00ccm I	140.00ccm V
TMGa#2 Pres_21	350.0Tor R	350.0Tor R	350.0Tor R	350.0Tor R	350.0Tor R
TEGa_6	25.20ccm I	25.20ccm I	25.20ccm I	103.00ccm V	103.00ccm R
TEGa Pres_22	475.0Tor R	475.0Tor R	475.0Tor R	475.0Tor R	475.0Tor R
AsH3#2_42	0.0ccm V	0.0ccm V	0.0ccm V	0.0ccm V	0.0ccm V
PH3_43	2000ccm R	2000ccm R	2000ccm R	1100ccm R	2000ccm R
CCl4_1	12.00ccm I	12.00ccm I	12.00ccm I	12.00ccm I	12.00ccm I
CCl4 Dil_57	50.0ccm R	50.0ccm R	50.0ccm R	50.0ccm R	50.0ccm R
CCl4 mix_58	12.00ccm R	12.00ccm R	12.00ccm R	12.00ccm R	12.00ccm R
CCl4 Pres_17	300.0Tor R	300.0Tor R	300.0Tor R	300.0Tor R	300.0Tor R

EXHIBIT 2

Joe Conklin /Emcore
05/05/2004 07:06 AM

To Paul Sharps/Emcore@Emcore
cc Rick Stall/Emcore@Emcore
bcc
Subject Re: Fw: GaInP2 Nucleation



Paul Sharps